disappointed that none of the many opportunities occurring were utilised of recording with the camera glimpses of the marine paradise and its wondrous inhabitants that are so abundantly discussed. Photographic replicas of coral scenes and their associated denizens have of late years been shown to be fairly easily attainable, and appeal more intelligibly to the comprehension of the lay reader than a wealth of descriptive text. This shortcoming notwithstanding, Prof. Semon's book may be recommended as a most readable and instructive one to all those to whom the Australian bush and coral strands are *terræ incognitæ*.

Should Prof. Semon contemplate another tropical Australian expedition, we would earnestly recommend him to provide himself with one of the simple mosquito tents, procurable at any of the northern ports. Armed with this device, the night of torture on the Jardine River, so graphically described at page 333 *et seq.*, would have been shorn of all its terrors, the shrill piping of the baffled enemy outside the canvas adding but a zest to the peaceful enjoyment of his otherwise vainly invoked repose.

W. SAVILLE-KENT.

THE READING, WRITING, AND ARITHMETIC OF THE NEOLITHIC TROGLODYTES.

A DISCOVERY of great interest has recently been made by M. Ed. Piette, and published by him in *l'Anthropologie* (Tome vii., 1896, p. 385). In a cave at Mas-d'Azil,[1] on the left bank of the Arise, in the Department of Ariège, he excavated a layer of pebbles that had been painted with peroxide of iron in various devices. These occurred above a deposit containing bones of the reindeer, red deer, aurochs, horse, &c., and below a cinder layer, in which were great quantities of a land-snail, *Helix memoralis*, which indicates a somewhat humid climate; above this were deposits, in which polished stone axes occurred, and also *Helix hortensis*, which suggests drier conditions.

The Quaternary Period, according to M. Piette, was divided into two eras—the end of the Glacial Period forming the dividing line.

The intermediate Transition Period commenced when the modern fauna had replaced the glacial fauna; it consisted of three phases: (1) the Cervian, when the implements were of the same form as those of the earlier Quaternary era, and when the hunters of the reindeer made harpoons and needles of reindeer bones, and engraved upon their antlers. The climate then ameliorated, as evidenced by the presence of trees, and the reindeer passed away; and (2) the Asylian phase, or the period of coloured pebbles occurred. By this time man had forgotten the arts of engraving and carving, and commenced to devote himself to cultivation, and painted quaint forms on rolled stones. (3) The Snail-shell phase indicated a warmer humid climate, when vegetation flourished, and man cultivated several kinds of fruit trees.[2] Although the last two layers belonged to the Neolithic Period, polished stone axes were not found in them, though they occurred at a higher level associated, as has been already stated, with *Helix hortensis*.

The ruddled pebbles are mostly rounded, oblong, and flattened pebbles of quartz or schist taken from the bed of the river. In some cases the whole surface is coloured, but most frequently a stone is marked on one or both sides with simple devices. Sometimes the margin of the pebble is painted so as to form a kind of border to the decoration (Figs. 3 and 5).

M. Piette classifies the devices as follows: numerals, symbols, pictographic signs, and alphabetical characters.

(1) *Numerals.*—A large number of stones were found with from one to eight lines (Figs. 1 and 2) running across them. These the author considers as indicating simple numerals. Never have more than eight lines been yet found on a stone. Some of the pebbles are marked with rounded or oval spots (Fig. 3). These are regarded as units of higher groups of figures—either nines, or more probably tens, and the Egyptian system is adduced as an argument in favour of this view. The spots vary in number, one stone bearing as many as twenty-three.

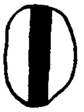
FIG. 1.

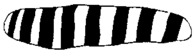
FIG. 2.

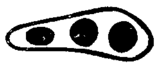
FIG. 3.

Occasionally marginal blotches were painted. The author's enthusiasm has led him to speculate whether these may not be the squares of the higher grade units; thus, a pebble (Fig. 4) with twelve marginal blotches and six central spots is credited with indicating a total of 1260 in the decimal system; or 1728+60, that is, 1788 on a duodecimal hypothesis. It apparently strikes even M. Piette that these are rather high numbers for the Neolithic troglodytes, and so he suggests that there may be no significant difference between central or marginal spots. As a disc surrounded by a circle has during all time been considered as the symbol of the sun or of a sun deity, the question is asked, "May not the circles in lines be signs employed in a hieratic writing?" Amongst other suggestions, he speculates whether they may not be meant to denote objects of special value; and, lastly, he seriously proposes the view that these very abundant numeral stones may have been counters in some game. Occasionally these "numerals" are ornamented, as in Fig. 5.

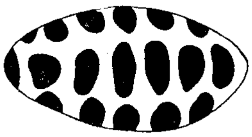
FIG. 4.

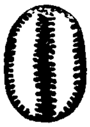
FIG. 5.

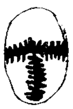
FIG. 6.

(2) *Symbols.*—M. Piette candidly admits that the conclusions of the "perilous study" of symbolism should be stated with the greatest reserve. Crosses, especially the equilateral cross (Fig. 7), are abundant, but the *tau* (Fig. 6) also occurs. We need not follow the speculations to which such designs irresistibly lead.

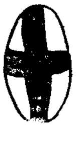
FIG. 7.

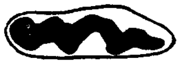
FIG. 8.

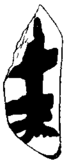
FIG. 9.

(3) *Pictographic Signs.*—Serpentine designs (Fig. 8) often occur, and M. Piette gives two personal anecdotes to illustrate the persistence of a superstitious regard for snakes in the Pyrenees and in the Department of Aisne. Other identifications are more doubtful, as, for instance, "trees" (Fig. 9), "reeds," &c.

(4) *Alphabetical Characters.*—The most startling section of this memoir is the suggestion that certain designs

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[1] A description of this remarkable tunnel-like cave was given by M. E. Cartailhac in *l'Anthropologie* (Tome ii., 1891, p. 141). This paper was illustrated by two figures of the cave itself, and by a plate of some of the painted pebbles.

[2] M. Piette has already published a paper on the cultivated plants of the Transition Period at Mas-d'Azil in *l'Anthropologie* (Tome vii., 1896, p. 1).

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painted on some of the pebbles indicate entirely conventionalised phonetic characters. Most of them are isolated markings, as in Fig. 10, which resembles the Greek Π and the Cypriot *go*. In a very few instances two or more symbols are associated together, as in Fig. 11. This is, as a matter of fact, the nearest approach to an inscription. M. Piette makes full use of the recent discoveries of Mr. Arthur J. Evans in early Mediterranean scripts, and we must leave it to experts to discuss the problems opened up by M. Piette's astonishing discoveries. Assuming these markings to be syllabic signs, can it be possible that these pebbles were employed in building up words and sentences, much as children use boxes of letters? The author states that "thirteen out of twenty-three Phœnician characters were equally Asylian graphic signs."

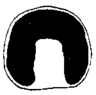

FIG. 10.

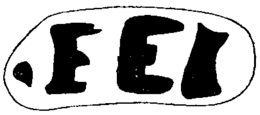

FIG. 11.

No longer can markings or designs, made by savage or primitive peoples, be ignored or be superciliously smiled upon as of no moment. We now recognise that such peoples do not while away their idle hours in making meaningless cabalistic signs, or in aimlessly decorating objects. When one looks through the twenty-five beautifully coloured plates of the atlas that accompanies this memoir, the belief is irresistible that these hundreds of pebbles have not wantonly been painted, but that thereon is recorded a hitherto unsuspected phase of prehistoric culture. At times one may feel a little good-natured amusement at the ingenuity displayed by M. Piette; but, at the same time, we respect his enthusiasm, and trust that he may be fortunate enough to bring further evidence to light. A. C. H.

EMIL DU BOIS-REYMOND.

AS was stated in our last issue, Emil du Bois-Reymond, Professor of Physiology in the University of Berlin, and Perpetual Secretary of the Berlin Academy, died on December 26, after a severe illness.

He was born in Berlin on November 7, 1818, where his father, who had begun life as a watchmaker in Neuchatel, had attained an important position. His mother was of Huguenot descent, her family having been driven out of their native country in the seventeenth century. He received his early education at the Collége Français at Berlin, and subsequently at the College of Neuchatel. He entered the university at Berlin when he was eighteen years of age, and was matriculated in the Philosophical Faculty.

At the outset of his university career his pursuits would appear to have been eclectic, for it is stated that he attended Neander's lectures, and was much interested in theology; but about 1837 he took to the serious studies of his life. After a year or two devoted to mathematics, physics and chemistry, he became a pupil of the illustrious J. Müller, and eventually his assistant. In 1841, he was asked by his chief to repeat the observations of Matteucci in his essay "Sur les phénomènes électriques des animaux," which had been published the year before in Paris. This led to the historical studies which he embodied in his dissertation for the degree of D.M. ("Quae apud veteres de piscibus electricis exstant argumenta"), and to the discovery of the main facts of what we now call electro-physiology. His first research on this subject was published in the fifty-eighth volume of *Poggendorff's Annalen*, under the title, "Ueber den sogenannten Froschstrom und über die elektromotorischen Fische." During the next ten years he devoted himself entirely to the line of inquiry he had determined to follow. The fruits of his labour were embodied, not in separate papers, but in his great work on "Animal Electricity," which was not completed till about ten years ago, although the first volume appeared in 1848. When, in 1855, he visited London, he had already acquired a European reputation. Some readers may, perhaps, remember the interest excited by a Friday evening lecture, with demonstrative experiments, which he gave at that time at the Royal Institution. In 1858 he succeeded Müller as Professor of Physiology at Berlin, and in 1867 became Secretary of the Berlin Academy. After the Franco-German war the palatial building in the Neue Wilhelmstrasse was erected according to plans which, with much forethought, he had designed, so as to provide for all the branches of physiological teaching and research. These were carried out with a completeness which has made the Berlin laboratory a model for similar institutions in all parts of the world.

About 1878 du Bois-Reymond published his "Collected Papers," in which all the scientific work done by him up to that time is included, excepting what had been recorded in the "Thierische Elektricitat," and in 1881 a volume appeared, shortly after the accident which deprived his assistant, Dr. Sachs, of his life, containing the results of Sachs' experimental investigations of the *Gymnotus electricus* in its native country.

To many readers who have no special interest in the scientific problems which it was the aim of his life to solve, du Bois-Reymond is known by his contributions to literature, and by the admirable literary style of his essays. Of his numerous writings on historical, biographical, and philosophical subjects, we can mention only the best known, such as (1) the historical introduction contained in the first chapters of his great work; (2) the essay on university organisation (1870); (3) on present and past of physiological teaching, and on the relations of natural history to natural science (1878); and (4) on the limits of natural knowledge (1882).

Du Bois-Reymond's life-work was the investigation of the electrical phenomena of animals and plants, and the relation between them and the vital endowments of the structures in which they manifest themselves. The first part of this task he accomplished all but perfectly. As regards the second, he arrived at theoretical conceptions which, although no longer so predominant as they were, still serve as points of departure in all electro-physiological discussions. To exemplify this, we must go back for a moment to the time fifty years ago, when he undertook the experimental criticism of Matteucci's work. Recognising that the electrical properties which had been described by his predecessors with relation to the whole organism could only be understood by referring them to the parts in which they manifested themselves, he at once limited his inquiry to the electromotive properties of the muscles, choosing for his purpose those of simplest construction—those which consist of parallel fibres. Considering that in such a muscle each fibre must be an epitome of the whole, and that if it were possible to break up a fibre into its constituent fibrils, its properties would also represent those of the whole, and having found experimentally that the surface of a cylinder obtained from a living cylindrical bundle of fibres by cutting it across in two places, exhibited in different parts differences of potential which could be expressed by a very simple law (the so-called law of the muscle current, according to which the centre of each cut surface is negative to every other part), it required but little use of the scientific imagination to suppose that if the cylinder contained elements of indefinite minuteness endowed with properties corresponding to its own, the result would

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